

IN THE CLAIMS:

Please amend the claims as follows:

-
1. (Currently Amended) An apparatus, including
- a mass storage device including one or more disk drives, each disk drive having a plurality of storage blocks, each of said storage blocks including a plurality of sectors;
- wherein each storage block of said plurality of storage blocks includes a data portion and an error code portion, said data portion storing data for said storage block, and said error code portion being responsive to said data portion; and
- wherein said error code portion includes integrity data for checking integrity of said error code portion.
2. (Previously Presented) An apparatus as in claim 1, wherein said disk drives are hard disks.
3. (Previously Presented) An apparatus as in claim 1, wherein said disk drives are part of a RAID storage device.
4. (Original) An apparatus as in claim 3, wherein said RAID storage device is a RAID level 4 device.

5. (Original) An apparatus as in claim 1, wherein said error code portion is appended to said data portion.

6. (Previously Presented) An apparatus as in claim 1, wherein said error code portion includes a checksum of said data.

b1 7. (Previously Presented) An apparatus as in claim 6, wherein said checksum includes 4-bytes of checksum data.

8. (Previously Presented) An apparatus as in claim 6, wherein said checksum is included in a block-appended checksum.

9. (Currently Amended) An apparatus as in claim 8, wherein said integrity data for checking integrity of said error code portion is ~~block-appended checksum includes~~ a further checksum included in ~~for checking integrity of~~ said block-appended checksum.

10. (Previously Presented) An apparatus as in claim 9, wherein said further checksum includes 4-bytes of data.

11. (Original) An apparatus as in claim 1, wherein said mass storage device includes a cache or RAM.

12. (Previously Presented) An apparatus as in claim 1, wherein said disk drives are formatted with 520-bytes per sector.

13. (Previously Presented) An apparatus as in claim 1, wherein said plurality of said sectors included in each of said storage blocks is eight sectors.

14. (Original) An apparatus as in claim 1, wherein said error code portion includes 64-bytes of error code data.

15. (Original) An apparatus as in claim 1, wherein said data portion includes 4,096-bytes of data.

16. (Original) An apparatus as in claim 1, wherein said sectors include 520-bytes of data storage.

17. (Original) An apparatus as in claim 1, wherein said storage block includes 4,160-bytes of data and error code storage space.

18. (Currently Amended) An apparatus, including
a mass storage device including one or more disk drives, each disk drive having a plurality of storage blocks, each of said storage blocks including a plurality of said sectors;

wherein for each storage block of said plurality of storage blocks, a first subset of said storage block is responsive to data for said storage block, a second subset of said storage block is responsive to error code information, and said error code information is responsive to said data; and

wherein said second subset of each storage block includes integrity data for checking integrity of said second subset.

b1
19. (Previously Presented) An apparatus as in claim 18, wherein said disk drives are hard disks.

20. (Previously Presented) An apparatus as in claim 18, wherein said disk drives are part of a RAID storage system.

21. (Original) An apparatus as in claim 20, wherein said RAID storage system is a RAID level 4 system.

22. (Original) An apparatus as in claim 18, wherein said second subset is appended to said first subset.

23. (Previously Presented) An apparatus as in claim 18, wherein said error code information includes a checksum of said data.

24. (Previously Presented) An apparatus as in claim 23, wherein said checksum includes 4-bytes of checksum data.

25. (Previously Presented) An apparatus as in claim 23, wherein said checksum is included in a block-appended checksum.

B
26. (Currently Amended) An apparatus as in claim 25, wherein said integrity data for checking integrity of said second subset is ~~block-appended checksum includes~~ a further checksum included in ~~for checking integrity of~~ said block-appended checksum.

27. (Previously Presented) An apparatus as in claim 26 wherein said further checksum includes 4-bytes of data.

28. (Original) An apparatus as in claim 18 wherein said mass storage device includes a cache or RAM.

29. (Previously Presented) An apparatus as in claim 18 wherein said disk drives are formatted with 520-bytes per sector.

30. (Previously Presented) An apparatus as in claim 18, wherein said plurality of said sectors included in each of said storage blocks is eight sectors.

31. (Original) An apparatus as in claim 18, wherein said second subset includes 64-bytes of error code data.

32. (Original) An apparatus as in claim 18, wherein said first subset includes 4,096-bytes of data.

33. (Original) An apparatus as in claim 18, wherein said sectors include 520-bytes of data storage.

34. (Original) An apparatus as in claim 18, wherein said first and second subsets together include 4,160-bytes of data and error code storage space.

35. (Currently Amended) A method for protecting data from data storage errors, said method including

determining a plurality of storage blocks in a disk drive of a mass storage system having one or more disk drives, each of said storage blocks including a plurality of sectors;

for each storage block of said plurality of storage blocks, dividing said storage block into a first subset and a second subset, and generating error code information responsive to data for a plurality of said sectors in said storage block;

wherein for each said storage block, said first subset is responsive to said data, and said second subset is responsive to said error code information; and

wherein said second subset includes integrity data for checking integrity of said second subset.

b1
36. (Previously Presented) A method as in claim 35, wherein said disk drives are hard disks.

37. (Previously Presented) A method as in claim 35, wherein said disk drives are part of a RAID storage system.

38. (Original) A method as in claim 37, wherein said RAID storage system is a RAID level 4 system.

39. (Original) A method as in claim 35, wherein said second subset is appended to said first subset.

40. (Previously Presented) A method as in claim 35, wherein said error code information includes a checksum of said data.

41. (Previously Presented) A method as in claim 40, wherein said checksum includes 4-bytes of checksum data.

42. (Previously Presented) A method as in claim 40, wherein said checksum is included in a block-appended checksum.

43. (Currently Amended) A method as in claim 42, wherein said integrity data for checking integrity of said second subset is ~~block-appended checksum includes~~ a further checksum included in ~~for checking integrity of~~ said block-appended checksum.

44. (Previously Presented) A method as in claim 43, wherein said further checksum includes 4-bytes of data.

45. (Original) A method as in claim 35, wherein said mass storage system includes a cache or RAM.

46. (Previously Presented) A method as in claim 35, wherein said disk drives are formatted with 520-bytes per sector.

47. (Previously Presented) A method as in claim 35, wherein said plurality of said sectors included in each of said storage blocks is eight sectors.

48. (Original) A method as in claim 35, wherein said second subset includes 64-bytes of error code data.

49. (Original) A method as in claim 35, wherein said first subset includes 4,096-bytes of data.

50. (Original) A method as in claim 35, wherein said sectors include 520-bytes of data storage.

b 51. (Original) A method as in claim 35, wherein said first and second subsets together include 4,160-bytes of data and error code storage space.

52. (Withdrawn) A method for efficiently detecting data errors in a mass storage system, said mass storage system including one or more disk drives, each disk drive having a plurality of storage blocks composed of a collection of sectors, including

reading data and error code information located in each of said storage blocks in a single operation;

calculating run-time error code information for said data located in storage blocks;

and

comparing said error code information with said run-time error code information.

53. (Withdrawn) A method as in claim 52, wherein said disk drives are hard disks.

54. (Withdrawn) A method as in claim 52, wherein said disk drives are part of a RAID storage system.

55. (Withdrawn) A method as in claim 52, wherein said RAID system is a RAID level 4 system.

h 56. (Withdrawn) A method as in claim 52, wherein said error code information is appended to said data.

57. (Withdrawn) A method as in claim 52, wherein said error code information includes a checksum of said data.

58. (Withdrawn) A method as in claim 57, wherein said checksum includes 4-bytes of checksum data.

59. (Withdrawn) A method as in claim 58, wherein said checksum is included in a block-appended checksum.

60. (Withdrawn) A method as in claim 59, wherein said block-appended checksum includes a further checksum for checking integrity of said block-appended checksum.

61. (Withdrawn) A method as in claim 60, wherein said further checksum includes 4-bytes of data.

62. (Withdrawn) A method as in claim 52, wherein said mass storage system includes a cache or RAM.

63. (Withdrawn) A method as in claim 52, wherein said disk drives are formatted with 520-bytes per sector.

64. (Withdrawn) A method as in claim 52, wherein said collection of sectors composing each of said storage blocks is eight sectors.

65. (Withdrawn) A method as in claim 52, wherein said error code information includes 64-bytes of error code data.

66. (Withdrawn) A method as in claim 52, wherein said reading data includes 4,096-bytes of data.

67. (Withdrawn) A method as in claim 52, wherein said sectors include 520-bytes of data storage.

68. (Withdrawn) A method as in claim 52, wherein said reading data and error code information together includes 4,160-bytes of data and error code storage space.

b1
69. (Withdrawn) A method as in claim 52, including determining whether said run-time error code information and said error code information in said storage blocks are equivalent.

70. (Withdrawn) A method as in claim 52, including alerting said mass storage system if said run-time error code information and said error code information in said storage blocks are not equivalent.

71. (Withdrawn) A method as in claim 52, including retrieving said reading data if said run-time error code information and said error code information in said storage blocks are equivalent.